Approach to the Patient with Affection and Disease of the Endocrine System

LECTURE IN INTERNAL MEDICINE PROPAEDEUTICS

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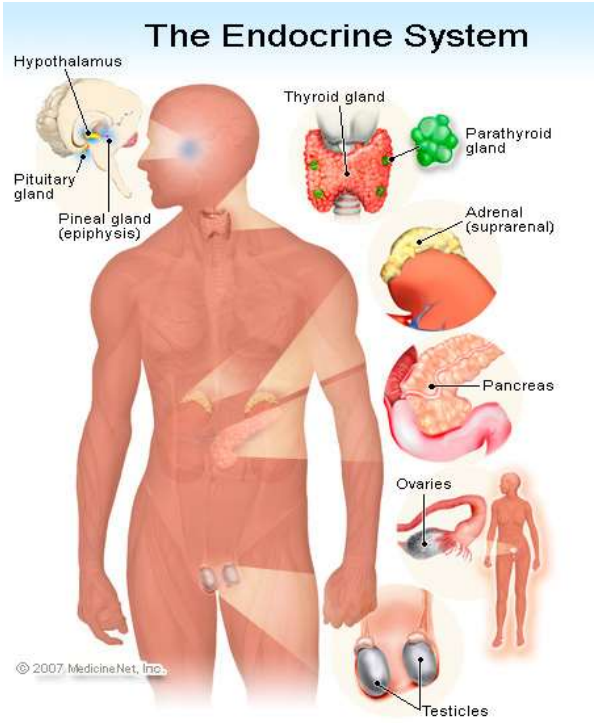
Plan of the lecture



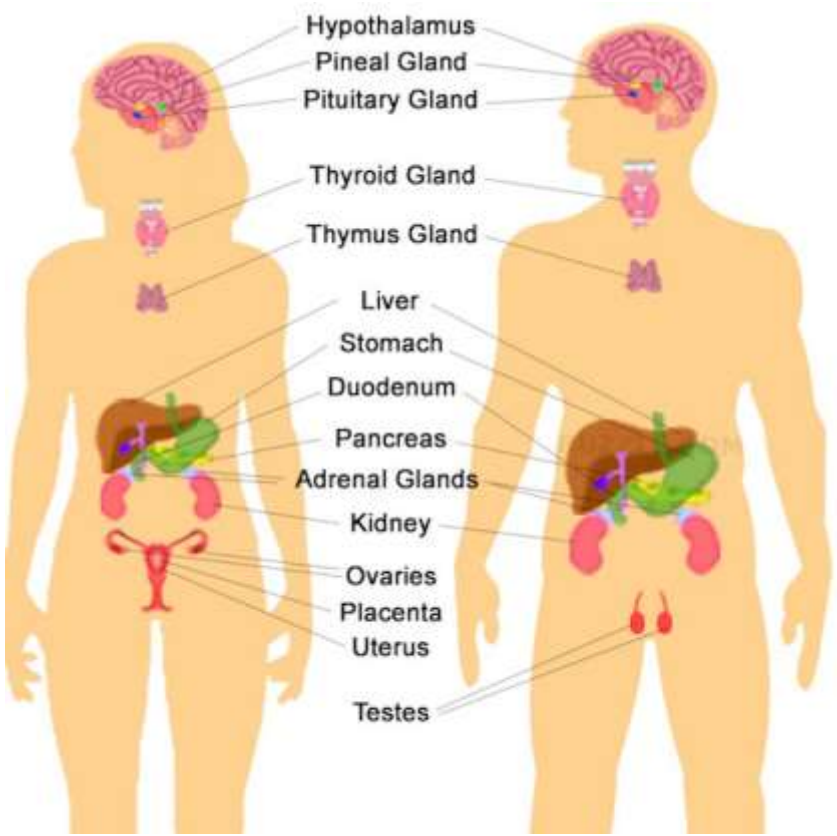
Approach to the Patient with Affection and Disease of the Endocrine System

- Endocrine system disorders definition
- Endocrine system disorders partial list
- Interviewing of the patient
- Physical examination of the patient
- Instrumental methods
- laboratory methods

http://images.emedicinehealth.com/images/illustrations/endocrine_system.jpg

Endocrine system disorders definition

- The endocrine system is a network of glands that produce and release hormones that help control many important body functions, especially the body's ability to change calories into energy that powers cells and organs
- Endocrine disorders are typically grouped into three categories: 1) endocrine gland hyposecretion (leading to hormone deficiency), 2) endocrine gland hypersecretion (leading to hormone excess), 3) tumours of endocrine glands



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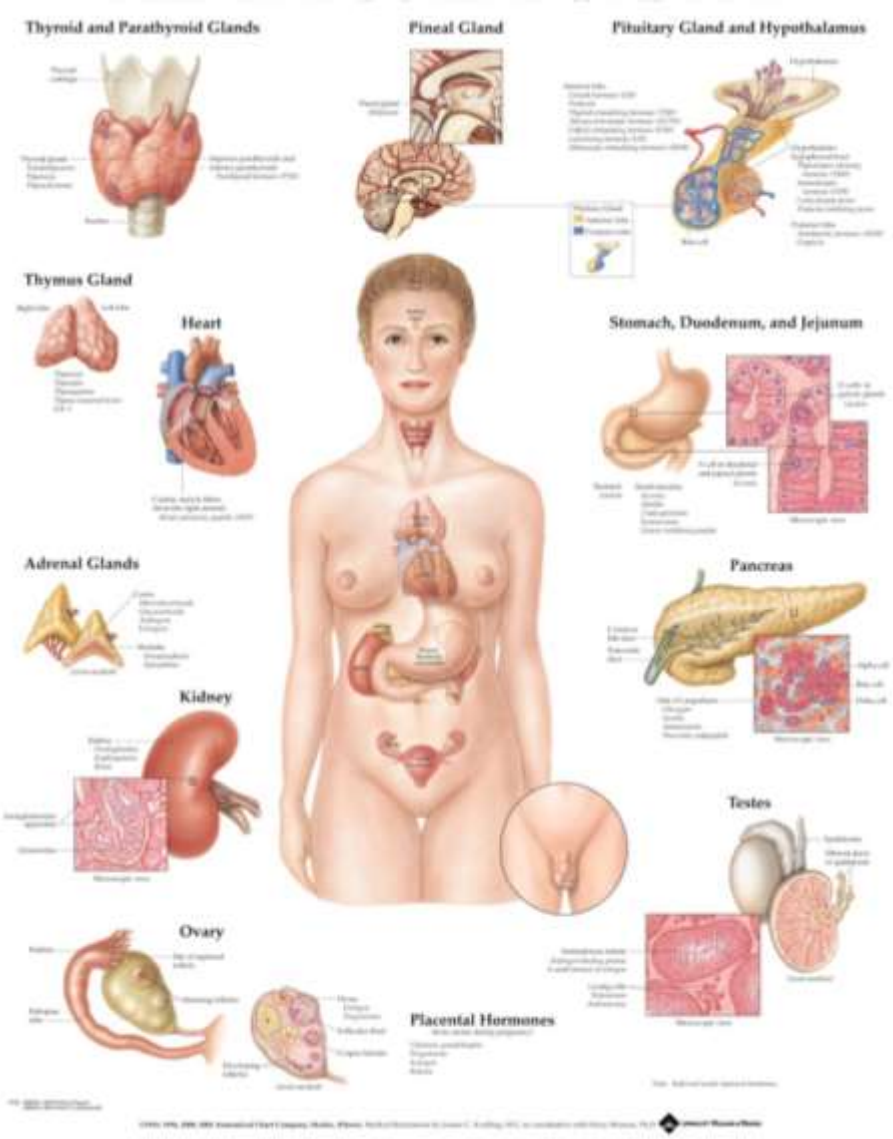
Endocrine system disorders partial list

- Addison disease and adrenal insufficiency
- Conn syndrome (primary hyperaldosteronism)
- Cushing syndrome or disease
- Diabetes mellitus
- Infertility
- Pituitary disorders
- Polycystic Ovary Syndrome (PCOS)
- Thyroid diseases



https://labtestsonline.org/understanding/conditions/endocrine/start/3 http://www.anatomystuff.co.uk/repository/product/user/img_img_9781587790157_endocrine_anatomy_chart.jpg

Endocrine glands, hormones and their function 1

ENDOCRINE GLAND	HORMONE(S) GLAND PRODUCE(S)	HORMONE FUNCTION
Hypothalamus		
	Growth hormone-releasing hormone (GHRH)	Stimulates growth hormone production by the pituitary
	Thyrotropin-releasing hormone (TRH)	Stimulates TSH production in the pituitary
	Corticotropin-releasing hormone (CRH)	Stimulates ACTH production by the pituitary
	Gonadotropin-releasing hormone (GnRH)	Stimulates LH and FSH production by the pituitary
	Prolactin inhibitory hormone (PIH, dopamine)	Inhibits prolactin production
	Oxytocin; produced by the hypothalamus; stored and secreted by the pituitary	Uterine contraction during labor
	Arginine vasopressin (AVP), also called antidiurectic hormone (ADH); produced by the hypothalamus; stored and secreted by the pituitary	Water balance

https://labtestsonline.org/understanding/conditions/endocrine/start/2

Endocrine glands, hormones and their function 2

ENDOCRINE GLAND	HORMONE(S) GLAND PRODUCE(S)	HORMONE FUNCTION
Pituitary	Prolactin	Milk production (milk production not related to pregnancy is called galactorrhea and is usually due to high prolactin)
	Growth hormone (GH)	Stimulates childhood growth, cell production, helps maintain muscle and bone mass in adults
	ACTH	Stimulates cortisol production by the adrenal glands
	TSH	Stimulates thyroid hormone production
	LH, FSH	Regulation of testosterone and estrogen, fertility
Thyroid	T4 (thyroxine) T3 (triiodothyronine)	Help regulate the rate of metabolism
	Calcitonin	Helps regulate bone status, blood calcium
Parathyroid	Parathyroid hormone (PTH)	Regulates blood calcium

https://labtestsonline.org/understanding/conditions/endocrine/start/2

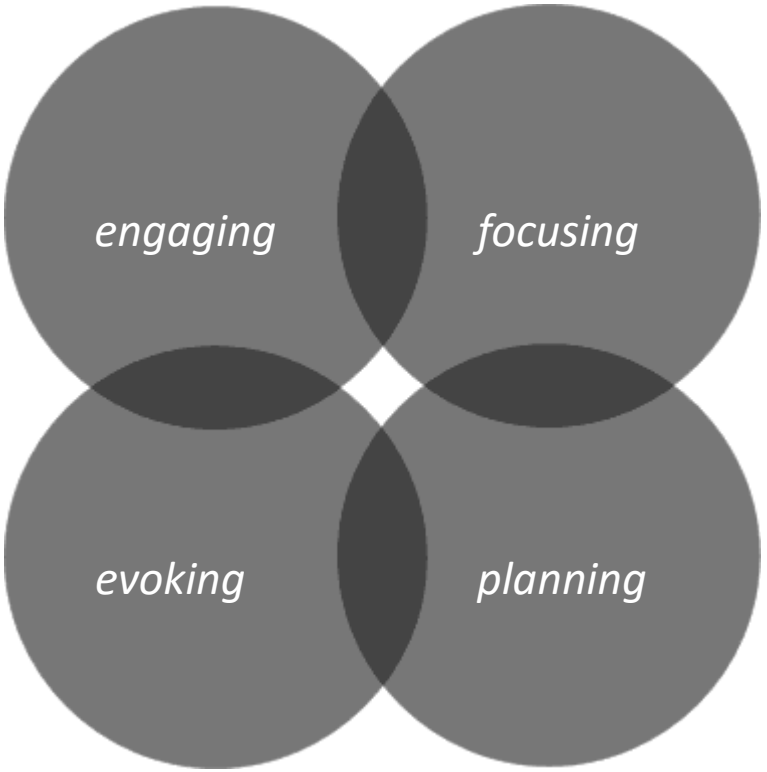
Endocrine glands, hormones and their function 3

ENDOCRINE GLAND	HORMONE(S) GLAND PRODUCE(S)	HORMONE FUNCTION
Adrenal	Epinephrine (adrenaline) Norepinephrine (Catecholamines)	Blood pressure regulation, stress reaction, heart rate
	Aldosterone	Salt, water balance
	Cortisol	Stress reaction
	DHEA-S	Body hair development at puberty
Ovaries (females only)	Estrogen Progesterone	Female sexual characteristics
Testicles (males only)	Testosterone	Male sexual characteristics
Pancreas	Insulin Glucagon Somatostatin	Glucose regulation
Pineal	Melatonin	Not well understood; Helps control sleep patterns, affects reproduction

https://labtestsonline.org/understanding/conditions/endocrine/start/2

Interviewing of the patient: four overlapping processes

1. *Engaging* (connecting with patients and establishing a good working relationship)
2. *Focusing* (agreeing on the target of motivational enhancement and directing the conversation toward it)
3. *Evoking* (drawing out the patients' own motivations for changing the target behavior)
4. *Planning* (developing commitment to change and formulating a specific plan of action)



http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3608718/ https://med.uc.edu/images/default-source/Medical-Education/medstudenta.jpg?sfvrsn=2

Interviewing of the patient: Good questions to get started on the core interview

Communication skills:

- Active listening
- Empathy
- Building rapport
- Open-ended questions
- Leading questions
- Silence
- “Why” questions
- Nonverbal communication cues

http://education.healthcaresource.com/wp-content/uploads/2011/12/shutterstock_70326385-resized-600.jpg http://samples.jbpub.com/9781449652722/9781449645106_CH01_001_036.pdf

Interviewing of the patient: Good questions to get started on the core interview

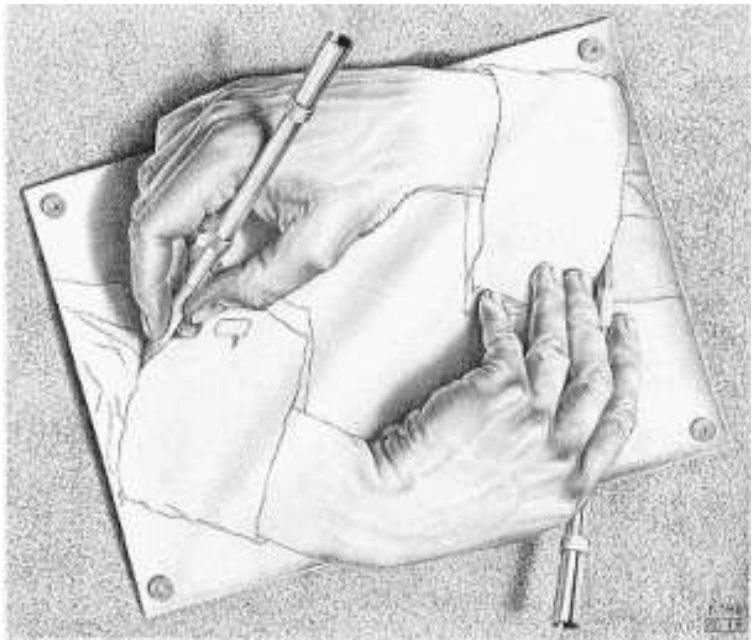
- What is your chief complaint?
- Tell me why you're here today
- Tell me about your injury
- What can I do to help you?
- Explain to me your understanding of your injury

http://www.nursebarb.com/wp-content/uploads/2013/09/concerned-midlife-woman.jpg

http://yabluchanskiy.com/klinicheskaya-praktika/approach-to-the-patient-with-disease-of-the-cardiovascular-system-podxod-k-pacientu-s-zabolevaniem-serdechno-sosudistoj-sistemy/

Interviewing of the patient: Patient profile

- Age
- Sex
- Race/Ethnicity
- Handedness
- Ht-Wt-BMI-Body type
- Primary language
- Barriers to learning
- Learning preference
- Unique rehabilitation goals



http://www.reading.ac.uk/web/MultimediaFiles/Handedness.png

Interviewing of the patient: general endocrine signs and symptoms

- When the endocrine glands or its hormones malfunction, a number of signs and symptoms may arise
- A disease of a specific endocrine gland or dysfunction of one or more of its hormones may cause very specific signs and symptoms
- List of general endocrine sings and symptoms is short:
- Weight gain (hypothyroidism, ovarian disorders, any condition that causes an excess of glucorticoids, atc.
- Weight loss (hyperthyroidism, diabetes mellitus, adrenal insufficiency)
- Alterations in facial structure may be due to diabetes mellitus, polycystic ovary syndrome (PCOS), Cushing's syndrome or acromegaly (excess growth hormone)
- Sexual/Reproductive Disorders (in both men and women, dysfunction with the gonads (ovaries in women, testes in men),pituitary dysfunction - follicle-stimulating hormone/luteinizing hormone (FSH/LH), thyroid dysfunction, diabetes, atc.)

http://www.healthhype.com/endocrine-diseases-and-disorders-general-signs-symptoms.html

Interviewing of the patient: weight gain

Different types of weight gain

Weight gain caused by Andropause

http://www.healthhype.com/endocrine-diseases-and-disorders-general-signs-symptoms.html https://www.globalliferejuvenation.com/weight_gain_in_men.html
http://www.pennmedicine.org/encyclopedia/em_PrintImage.aspx?gcid=19265&ptid=2

Interviewing of the patient: weight loss

Adrenal fatigue weight loss

Addison's Disease weight loss

https://pedclerk.bsd.uchicago.edu/sites/pedclerk.uchicago.edu/files/uploads/hyperpigmentation_1_0_0.jpg http://www.healthhype.com/endocrine-diseases-and-disorders-general-signs-symptoms.html

Interviewing of the patient: alterations in facial structure

Acromegaly

Polycystic Ovary Syndrome

Cushing's syndrome

http://cdn.popdust.com/wp-content/uploads/2014/02/Bearded-Woman-Photos-Video-Harnaam-Kur-Polycystic-Ovary-Syndrome-FE-452x254.jpg
http://lh5.ggpht.com/_Jt4VKh8rCv0/StSxFPHwRlI/AAAAAAAABdA/os9p3_8SFJk/s1600/bonny_hamm%5B2%5D.jpg

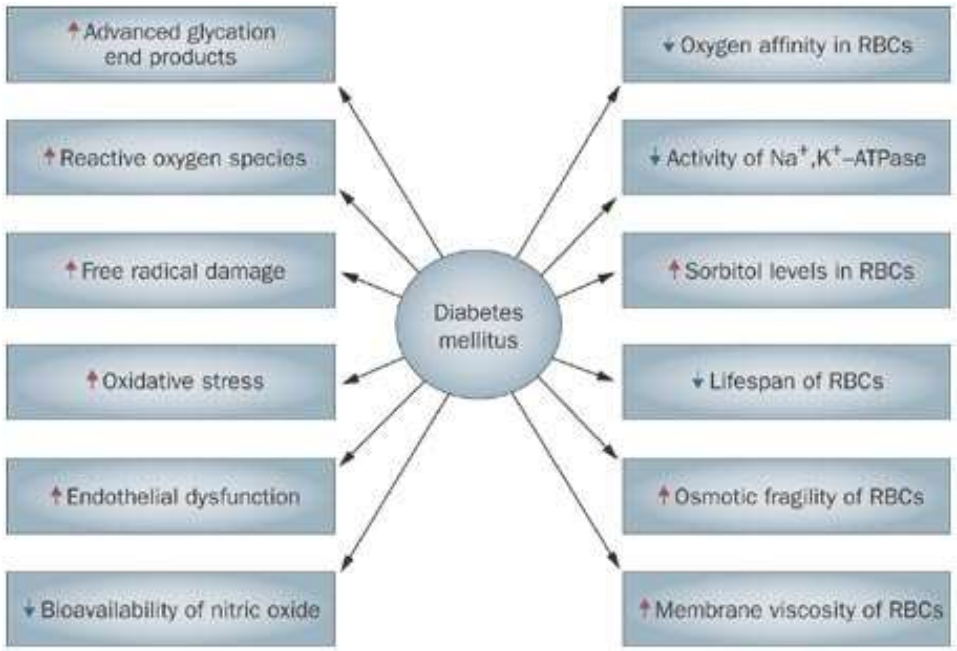
Interviewing of the patient: sexual/reproductive disorders

Yoga poses for Reproductive organs

https://enhancinghumanperformance.files.wordpress.com/2014/01/yoga-eagle-posture-male-female-001.jpg

Interviewing of the patient: common symptoms of diabetes

- Diabetes mellitus occurs when the pancreas either does not produce sufficient insulin or the body cannot use the available insulin
- Symptoms of both type 1 and type 2 diabetes include:
  - Excessive thirst or hunger
  - Fatigue
  - Frequent urination
  - Nausea and vomiting
  - Unexplained weight loss or gain
  - Vision changes



http://www.healthgrades.com/conditions/endocrine-disorders--symptoms http://www.nature.com/nrendo/journal/v5/n4/images/nrendo.2009.17-f2.jpg

Interviewing of the patient: common symptoms of acromegaly

Acromegaly is a disorder in which the pituitary gland overproduces growth hormone. This leads to symptoms of overgrowth, especially of the hands and feet. Symptoms of acromegaly include:

- Abnormally large lips, nose or tongue
- Abnormally large or swollen hands or feet
- Altered facial bone structure
- Body and joint aches
- Deep voice
- Fatigue and weakness
- Headaches
- Overgrowth of bone and cartilage and thickening of the skin
- Sexual dysfunction, including decreased libido
- Sleep apnea
- Vision impairment

http://www.healthgrades.com/conditions/endocrine-disorders--symptoms

Interviewing of the patient: common symptoms of acromegaly

Abnormally large lips, nose, tongue

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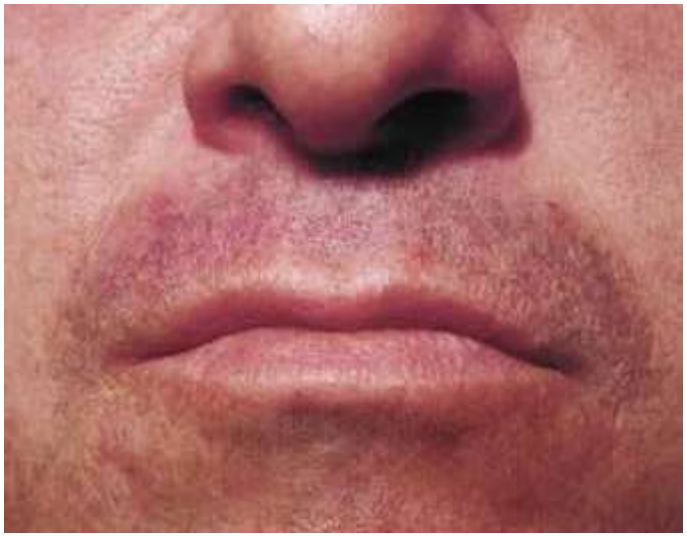
Interviewing of the patient: common symptoms of Addison's disease

Addison's disease is characterized by decreased production of cortisol and aldosterone due to adrenal gland damage. Common symptoms of Addison's disease include:

- Depression
- Diarrhea
- Fatigue
- Headache
- Hyperpigmentation of the skin (bronze appearance)
- Hypoglycemia (low blood glucose)
- Loss of appetite
- Low blood pressure (hypotension)
- Missed menstrual periods
- Nausea, with or without vomiting
- Salt cravings
- Unexplained weight loss
- Weakness (loss of strength)

http://www.healthgrades.com/conditions/endocrine-disorders--symptoms

Interviewing of the patient: common symptoms of Addison's disease



Hyperpigmentation of the skin (bronze appearance)

http://www.cutis.com/fileadmin/qhi_archive/ArticlePDF/CT/076020097.pdf http://www.formulamedical.com/Assets/Pictures/Symptoms/rosacea.jpg

Interviewing of the patient: common symptoms of Cushing's syndrome

Cushing's syndrome arises from excess cortisol, produced by the adrenal glands. Symptoms of Cushing's syndrome include:

- Buffalo hump (fat between the shoulder blades)
- Skin discoloration such as bruising
- Red striae (irregular areas of skin that look like bands, stripes, or lines)
- Fatigue
- Feeling very thirsty
- Thinning and weakening of the bones (osteoporosis)
- Frequent urination
- High blood sugar (hyperglycemia)
- High blood pressure (hypertension)
- Irritability and mood changes
- Obesity of the upper body
- Rounded "moon" face
- Weakness (loss of strength)

http://www.healthgrades.com/conditions/endocrine-disorders--symptoms

Interviewing of the patient: common symptoms of Cushing's syndrome

Buffalo hump

Striations

Rounded "moon" face

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Interviewing of the patient: common symptoms of Graves' disease

Graves' disease is a type of hyperthyroidism resulting in excessive thyroid hormone production. Common symptoms of Graves' disease include:

- Bulging eyes (Graves' ophthalmopathy)
- Diarrhea
- Difficulty sleeping
- Fatigue and weakness
- Goiter (enlargement of the thyroid gland)
- Heat intolerance
- Irregular heart rate
- Irritability and mood changes
- Rapid heart rate (tachycardia)
- Thick or red skin on the shins
- Tremors
- Unexplained weight loss

http://www.healthgrades.com/conditions/endocrine-disorders--symptoms

Interviewing of the patient: common symptoms of Graves' disease

Bulging eyes

Goiter

Thick or red skin on the shins

http://medicalpoint.org/wp-content/uploads/2013/02/grave%E2%80%99s-disease-pictures-2.jpg http://diseasespictures.com/wp-content/uploads/2013/07/Goiter.jpg
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Interviewing of the patient: common symptoms of Hashimoto's thyroiditis

Hashimoto's (autoimmune) thyroiditis is a condition in which the thyroid is targeted by the immune system, leading to hypothyroidism and low production of thyroid hormone. Often disease is symptomless, but symptoms can include:

- Cold intolerance
- Constipation
- Dry hair and loss of hair
- Fatigue
- Goiter (enlargement of the thyroid gland)
- Joint and muscle pain
- Missed menstrual periods
- Slowed heart rate
- Weight gain

http://www.healthgrades.com/conditions/endocrine-disorders--symptoms http://m.patient.media/images/om938a.jpg

Interviewing of the patient: common symptoms of hyperthyroidism

Hyperthyroidism is a condition characterized by an overactive thyroid gland. Common symptoms of hyperthyroidism include:

- Diarrhea
- Difficulty sleeping
- Fatigue
- Goiter (enlargement of the thyroid gland)
- Heat intolerance
- Irritability and mood changes
- Rapid heart rate (tachycardia)
- Tremors
- Unexplained weight loss
- Weakness (loss of strength)

http://www.healthgrades.com/conditions/endocrine-disorders--symptoms http://medicalpicturesinfo.com/wp-content/uploads/2011/10/Goiter-2.jpg

Interviewing of the patient: common symptoms of hypothyroidism

Hypothyroidism is a condition in which the thyroid is underactive and produces too little thyroid hormone. Common symptoms include:

- Cold intolerance
- Constipation
- Decreased sweat production
- Dry hair
- Fatigue
- Goiter (enlargement of the thyroid gland)
- Joint and muscle pain
- Missed menstrual periods
- Slowed heart rate
- Swollen face
- Unexplained weight gain

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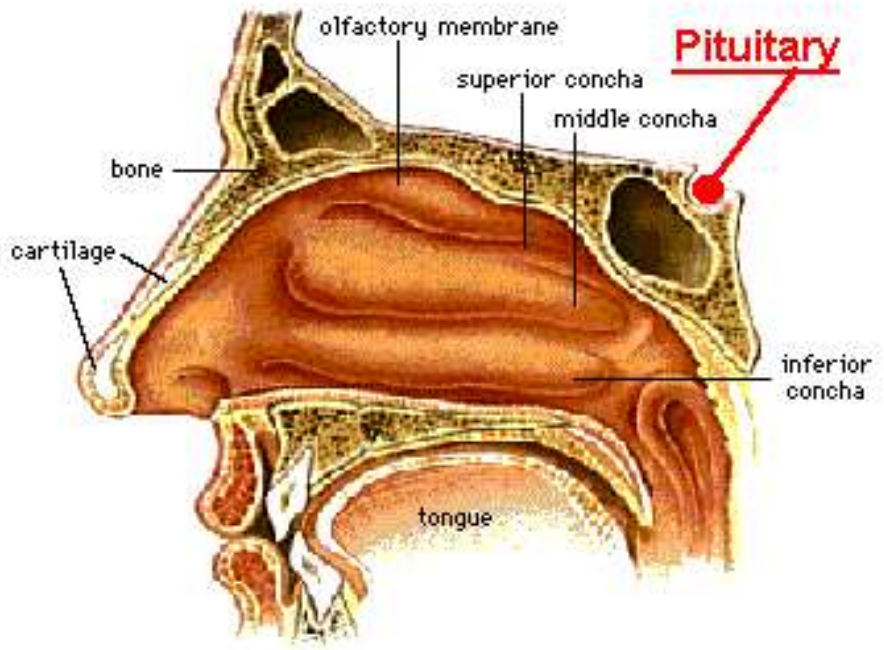
Interviewing of the patient: common symptoms of prolactinoma

Prolactinoma arises when a dysfunctional pituitary gland makes excess prolactin hormone, which functions in the production of breast milk. Excess prolactin can lead to symptoms such as:

- Erectile dysfunction
- Infertility
- Loss of libido
- Missed menstrual periods
- Unexplained milk production



http://www.healthgrades.com/conditions/endocrine-disorders--symptoms http://www.oocities.org/chris_anthistle/graphics/nose.gif

Interviewing of the patient: serious symptoms that might indicate a life-threatening condition

- Confusion or loss of consciousness for even a brief moment
- Dangerously low or high blood pressure (extreme hypotension or hypertensive crisis)
- Dangerously slow or fast heart rate
- Dehydration
- Depression or anxiety
- Difficulty breathing
- Eye problems, including dryness, irritation, pressure, pain or bulging
- Severe fatigue or weakness
- Severe, unexplained headache
- Severe vomiting and diarrhea
- Hyperthermia
- Sleep disturbances

http://www.healthgrades.com/conditions/endocrine-disorders--symptoms http://photos.demandstudios.com/getty/article/103/91/86543321_XS.jpg

Interviewing of the patient: specific questions for set of complaints

Each of complaints will prompt a series of specific questions that will help arrive at a preliminary single diagnosis, or a group of different diagnoses

http://yabluchanskiy.com/klinicheskaya-praktika/approach-to-the-patient-with-disease-of-the-cardiovascular-system-podxod-k-pacientu-s-zabolevaniem-serdechno-sosudistoj-sistemy/

Interviewing of the patient: example of specific questions in complaint

- Character
- Location
- Severity
- Timing
- Duration
- Radiation
- Provocation
- Relieving conditions
- When did it first start?
- How often does it occur?
- Is it becoming more frequent with time?
- Were there associated symptoms
- Are the symptoms lasting longer?
- How the symptoms relate to food intake?

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Interviewing of the patient: past medical history

In a medical encounter, a past medical history (abbreviated PMH), is the total sum of a patient's health status prior to the presenting problem

http://www.pedsendony.com/img/medical-forms.jpg https://en.wikipedia.org/wiki/Past_medical_history

Interviewing of the patient: past medical history

Alimentary changes

- Weight loss (thyrotoxicosis, diabetes mellitus (DM 1 type)) vs. gain (Cushing's, hypothalamic disease, DM 2 type, hypothyroidism)
- Appetite: loss (Addison's) vs. increased (thyrotoxicosis)
- Diarrhea (hyperthyroid, Addison's)
- Constipation (hypothyroidism, hypercalcemia)
- Polydipsia [excess drinking] (DM, renal dz, hypercalcemia)

Integumental changes

- Pigmentation (hypopituitarism, Cushing's, acromegaly, Addison's)
- Dryness (hypothyroidism, hypoparathyroidism)
- Sweating (hyperthyroidism, pheochromocytoma, arcomegaly)
- Overgrowth (acromegaly)

http://www.doctorshangout.com/page/endocrine-system-physical-examination

Interviewing of the patient: past medical history

Nervous changes

- Nervousness, irritability (thyrotoxicosis)
- Fatigue (hypothyroid, diabetes mellitus (DM), Addison's, acromegaly)
- Headaches (hypoglycemia)
- Seizures (hypoglycemia)
- Visual loss (acromegaly, DM)

Rheumatoid changes

- Shorter stature
- Gigantism (Marfan's, Kleinfelter's, growth hormone)
- Hand, skull bony growth (acromegaly)

Urogenital changes

- Polyuria (DM, DI, polydipsia)
- Menstrual changes (polycystic ovary, pituitary disease)

http://www.doctorshangout.com/page/endocrine-system-physical-examination

Interviewing of the patient: prior or current treatment

- Any constantly used drug for hormonal disorders, hypertension, cardiac disorders, cancer, arthritis, immunopathological processes, psychiatric disorders, atc.
- Previous surgery (thyroid surgery, radiation, pituitary surgery, etc.)
- Injections
- Chiropractic
- Exercise/PT (Physical Therapy)
- ER (Emergency Room)
- Massage therapy

http://www.pathologyoutlines.com/images/marrow/047.jpg

Interviewing of the patient: previous treatment and present status

- Previous Treatment
  - What?
  - Where?
  - When?
  - By whom?
- Present Status
  - Better vs. same vs. worse

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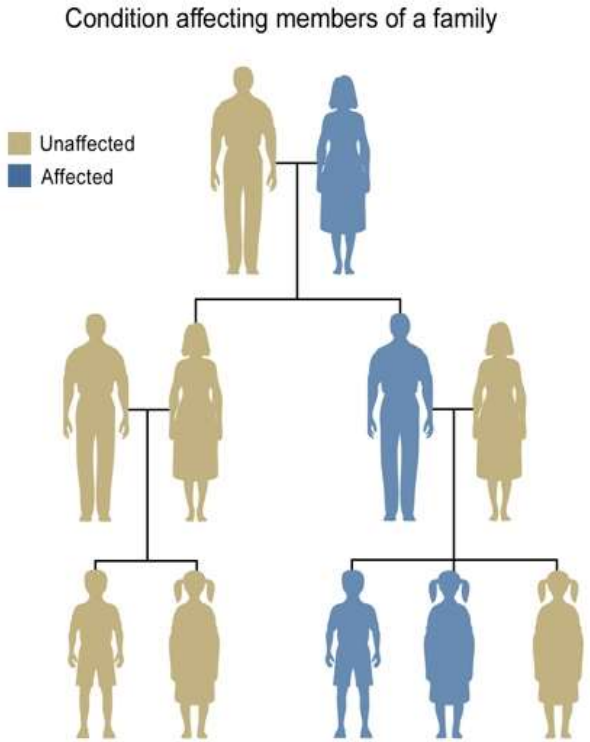
https://thestatuswoe.files.wordpress.com/2013/04/the-status-woe.jpg?w=630

Interviewing of the patient: family history and genetic risk

- An endocrine disorder in a member of the person's family
- The physician will inquire about the health of the patient's parents, brothers, sisters and children
- A family history of the diseases of endocrine system may be relevant to the underlying problem (multiple endocrine neoplasia (MEN) or congenital hypothyroidism)



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http://ghr.nlm.nih.gov/handbook/illustrations/pedigree.jpg

Interviewing of the patient: social history

- High-risk behaviors
  - Alcohol, tobacco, or drug abuse
  - Depression
  - Violence
  - Sedentary lifestyle
  - Exposures to physical or mental stressors
- Signs of any of the above behaviors may warrant referral to a secondary provider

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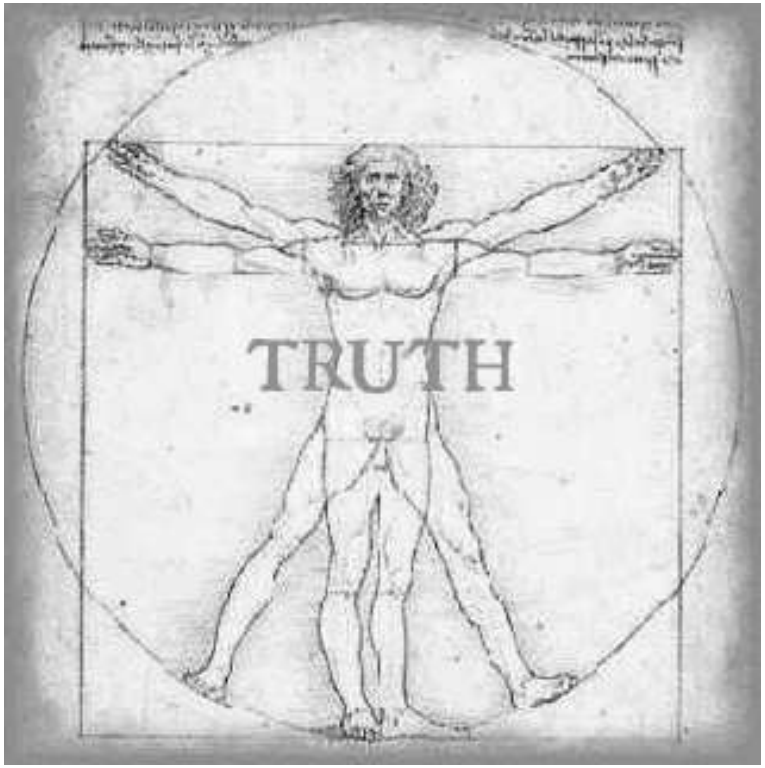
http://cdn.theatlantic.com/assets/media/img/mt/2015/05/image682/lead_960.jpg?1431438394

Interviewing of the patient: why take a medical history?

- Up to 90% of conditions can be accurately diagnosed or recognized by conducting a thorough medical history and listening carefully to the patient's response(s)
- Determines the necessary tests and measures you should prioritize for your objective examination



The Truth about When Doctors Don't Tell the Truth

http://si.wsj.net/public/resources/images/HE-AA132_PRIVAC_J_20150625121323.jpg

Interviewing of the patient: review of systems

- The "laundry list" of symptoms related to various organs of the body
- A series of questions helps seek out information that the patient may have neglected to provide the physician
- Review of systems helps to identify the patient's problem, or exclude different parts of the differential diagnosis

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http://twelvewellness.com/wp-content/uploads/2014/10/Hormones-564x480.jpg

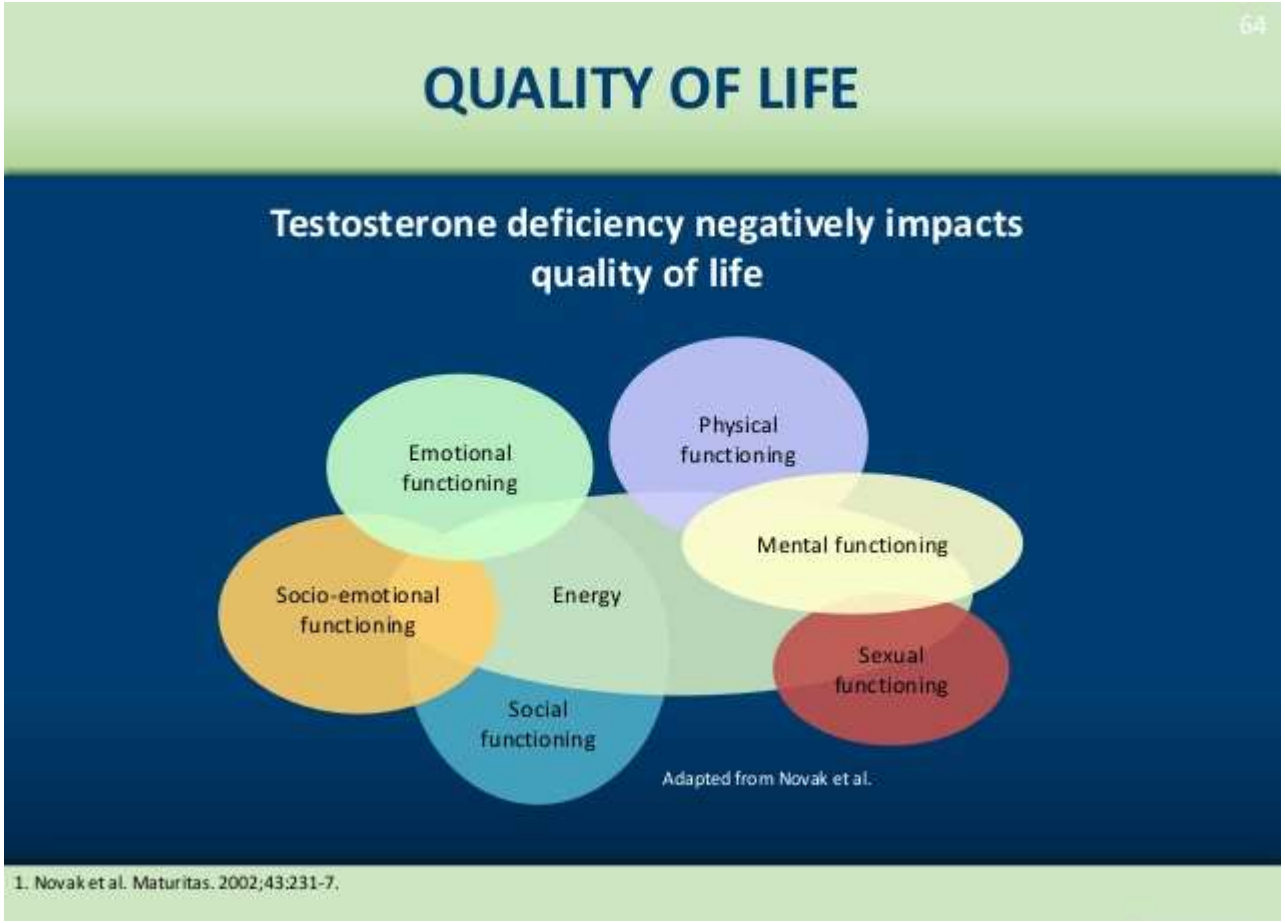
Interviewing of the patient: systemic enquiry

- General: fever, weight loss, loss of appetite, lethargy
- Respiratory and cardiovascular systems: shortness of breath, cough, hemoptysis, wheeze, chest pain
- Gastrointestinal system: nausea and vomiting, hematemesis, dysphagia, heartburn, jaundice, abdominal pain, change in bowel habit, rectal bleeding, tenesmus (sensation of incomplete bowel emptying)
- Genito-urinary system: dysuria (pain on passing urine), frequency, terminal dribbling, urethral discharge
- Gynecological system: pelvic pain, vaginal bleeding, vaginal discharge, LMP
- Neurological system: headaches, dizziness, loss of consciousness, fits, faints, funny turns, numbness, tingling, weakness, problems speaking, change in vision
- Musculoskeletal system and connective tissue: joint stiffness and swelling, muscle weakness, bone fractures , sensitivity to sunlight, malaise, cold and numb fingers or toes
- Rash

http://yabluchanskiy.com/klinicheskaya-praktika/approach-to-the-patient-with-disease-of-the-cardiovascular-system-podxod-k-pacientu-s-zabolevaniem-serdechno-sosudistoj-sistemy/

Interviewing of the patient:

of the Quality of Life Indexes in Endocrine Diseases



http://image.slidesharecdn.com/feb-140226201505-phpapp02/95/feb-2014-mens-urological-health-cme-testosterone-replacement-64-638.jpg?cb=1393445933

Physical examination of the patient: the main points: hands

- Oversized hands (acromegaly)
- Heat (hyperthyroid)
- Tremor (hyperthyroid)
- Palmar erythema (hyperthyroid)
- Pigmentation of palmar crease (Addison's, but normal in asians, blacks)
- 3rd, 5th metacarpals shortened (pseudohypoparathryoid)
- Pulse: rate (hyper-, hypothyroid), rhythm, character

http://www.doctorshangout.com/page/endocrine-system-physical-examination http://www.dermaamin.com/site/atlas-of-dermatology/15-p/1215-palmar-erythema-.pdf

Physical examination of the patient: the main points: arms

- Blood pressure for hypertension (Cushing'), hypotension (Addison's)
- Trousseau's sign (hypercalcemia):
  - Occlude brachial artery for 3 min using BP cuff
  - See if carpal spasm is induced
- Muscle weakness (hypothyroid, Cushing's, Conn's)

http://www.doctorshangout.com/page/endocrine-system-physical-examination http://img.medscape.com/pi/features/slideshow-slide/gait-abnormalities/fig3.jpg

Physical examination of the patient: the main points: axillae

- Acanthosis nigricans (acromegaly)
- Axillary hair loss (hypopituitary)
- Skin tags (acromegaly)

http://www.doctorshangout.com/page/endocrine-system-physical-examination http://escholarship.org/uc/item/1cp0973g/4.jpg

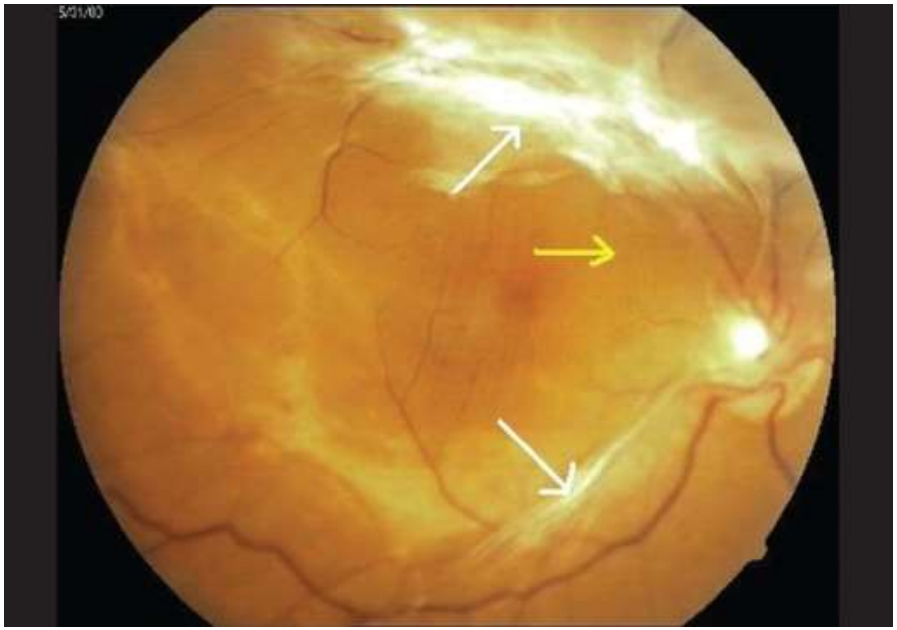
Physical examination of the patient: the main points: face

- Syndrome faces
- Acne, oily skin (Cushing's)
- Hirsutism (panhypopituitary)
- Chin enlargement (acromegaly)

http://www.doctorshangout.com/page/endocrine-system-physical-examination http://fce-study.netdna-ssl.com/2/images/upload-flashcards/95/77/05/4957705_m.jpg

Physical examination of the patient: the main points: eyes

- Exophthalmos (hyperthryoid)
- Eye fundus:
  - (diabetes mellitus)
  - (acromegaly)



diabetic retinopathy

http://www.doctorshangout.com/page/endocrine-system-physical-examination
http://openi.nlm.nih.gov/imgs/512/371/3003861/3003861_OJO-3-96-g001.png

Physical examination of the patient: the main points: mouth

- Buccal pigmentation (Addison's)
- Tongue enlargement (acromegaly)

http://www.doctorshangout.com/page/endocrine-system-physical-examination http://bestpractice.bmj.com/best-practice/images/bp/en-gb/56-3_default.jpg

Physical examination of the patient: the main points: neck

- Inspect buffalo hump (Cushing's)
- Palpate supraclavicular fat pads (Cushing's)
- Inspect webbed neck (Turner's)

http://www.doctorshangout.com/page/endocrine-system-physical-examination
http://static1.1.sqspcdn.com/static/f/822090/24471917/1394120085307/Cushings+supraclav+adipose.jpg?token=IzB9qAtJUOMOlEX%2FH4Z6c2YIofU%3D

Physical examination of the patient: the main points: thyroid

- Inspect for goiter
- Doctor palpates patient's thyroid from behind

http://www.doctorshangout.com/page/endocrine-system-physical-examination
http://www.karensmyers.com/wp-content/uploads/2010/10/scar.jpg

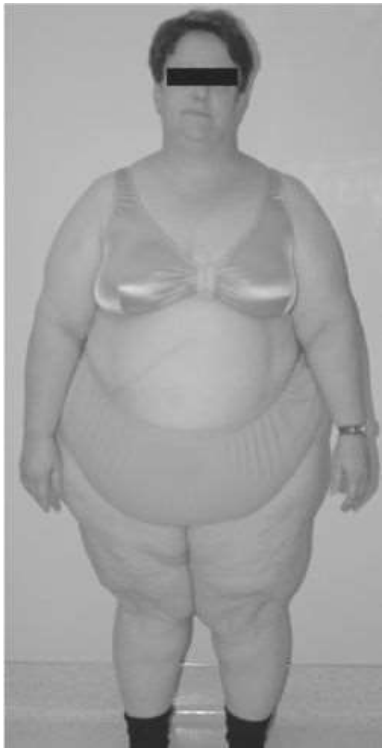
Physical examination of the patient: the main points: chest

- Pigmented nipple (Addison's)
- Loss, gain of chest hair
- Male gynecomastia (Cushing's)
- Reduced female breast size (panhypopituitary)

http://www.doctorshangout.com/page/endocrine-system-physical-examination http://www.clevelandclinicmeded.com/

Physical examination of the patient: the main points: abdomen

- Patient lies down, one pillow under head
- Purple striae (Cushing's)
- Disproportionate abdominal fat (Cushing's)



http://www.doctorshangout.com/page/endocrine-system-physical-examination http://img.tfd.com/mosbycam/thumbs/500185-fx3.jpg

Physical examination of the patient: the main points: genitalia

- Atrophy
- Virilization

http://www.doctorshangout.com/page/endocrine-system-physical-examination http://www.scielo.br/img/revistas/abem/v56n8/a20fig01b.jpg

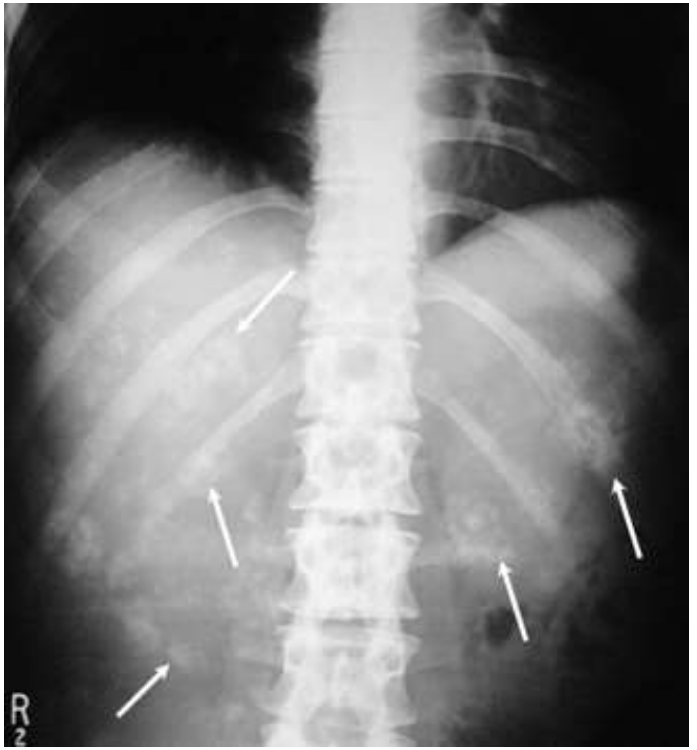
Physical examination of the patient: the main points: legs

- Peripheral neuropathy (diabetes mellitus)
- Toenails and foot showing same symptoms as Fingernails and Hands

http://www.doctorshangout.com/page/endocrine-system-physical-examination http://cdn2.hubspot.net/hub/28884/file-13844436-jpg/images/feet.jpg

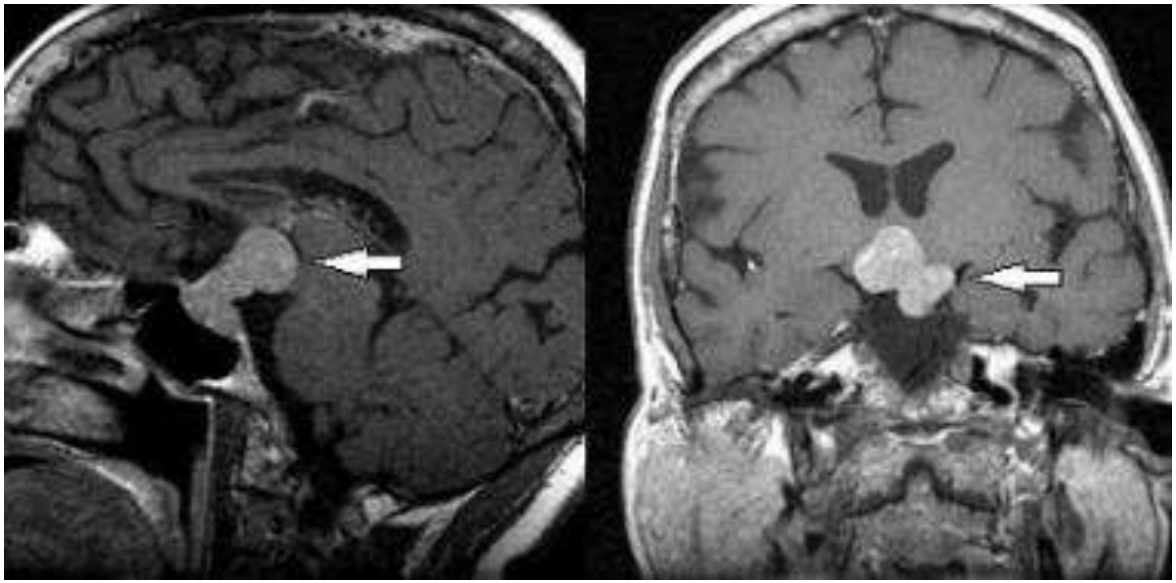
Instrumental methods: X-ray

- The radiograph reveals hepatomegaly and multiple calcifications in the upper abdomen (arrows) concerning for hepatic metastases
- The patient was ultimately found to have medullary carcinoma of the thyroid with extensive metastatic spread
- The liver is a very common location for metastatic spread from a variety of malignancies



http://reference.medscape.com/features/slideshow/non-intestinal-xray

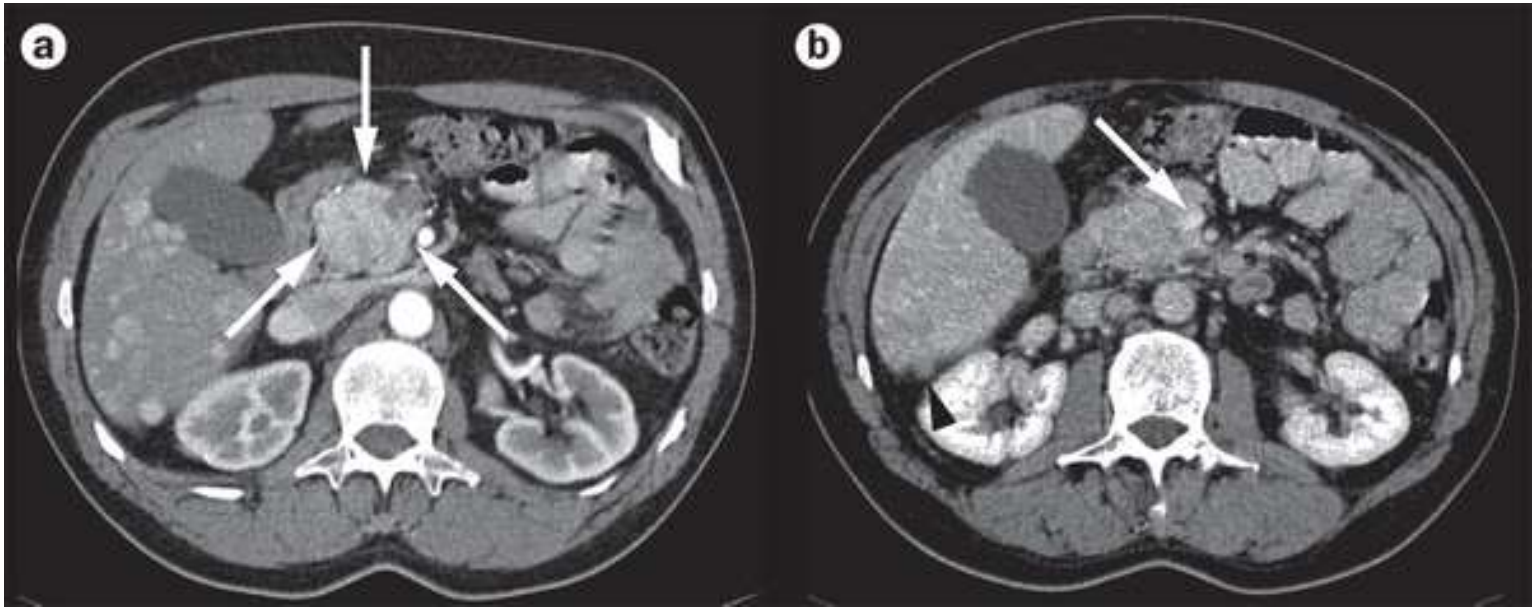
Instrumental methods: magnetic resonance imaging



Sagittal (left image) and coronal (right image) T1-weighted magnetic resonance images of the brain in a patient with multiple endocrine neoplasia syndrome

http://emedicine.medscape.com/article/390728-overview

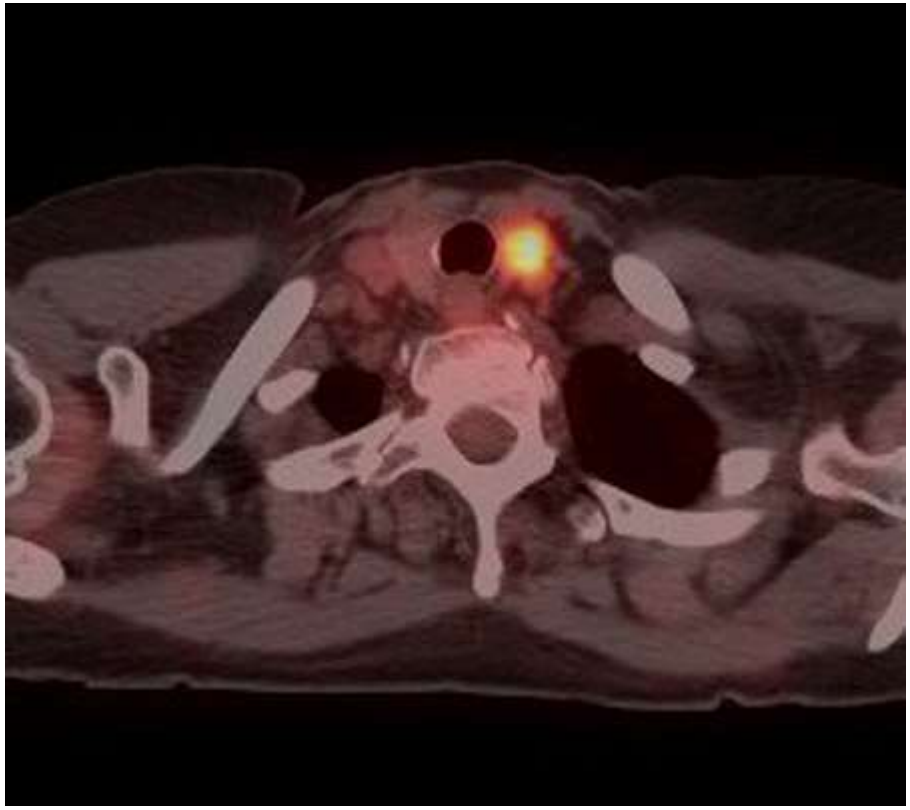
Instrumental methods: computer tomography (CT)



Neuroendocrine pancreatic tumor in arterial (a) and venous (b) computer tomography phases

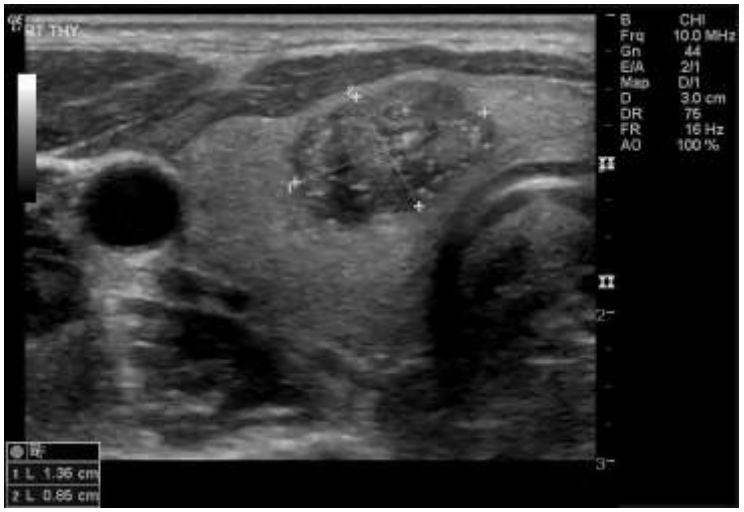
http://www.nature.com/nrendo/journal/v10/n2/images_article/nrendo.2013.246-f1.jpg

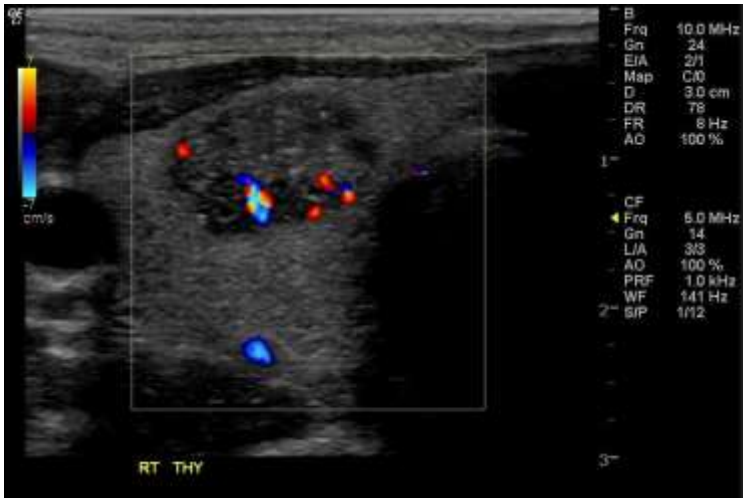
Instrumental methods: PET/CT



Positive thyroid nodule on PET CT imaging

Instrumental methods: ultrasound

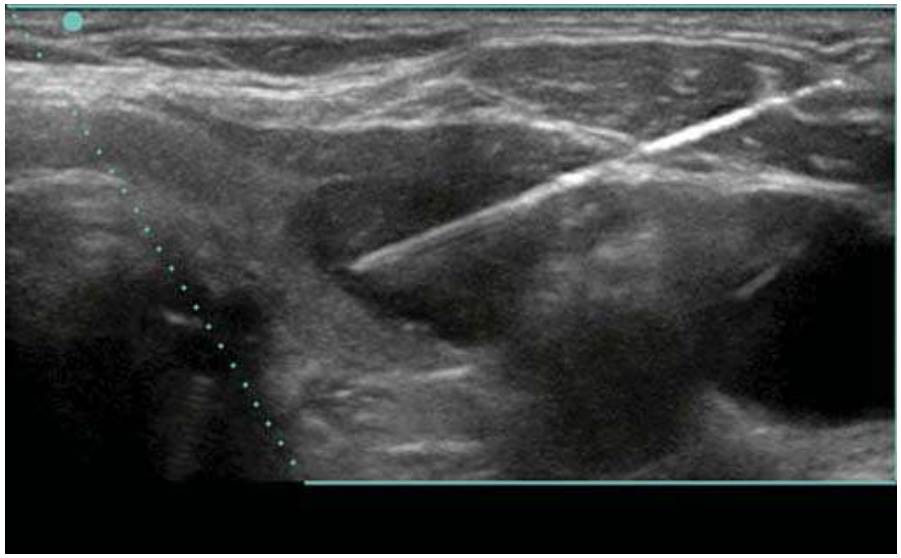




The hyperplastic thyroid nodule, also termed a colloid or adenomatous nodule

https://www.med-ed.virginia.edu/courses/rad/Thyroid_Ultrasound/images/Adenomatous%20nodule.jpg

Instrumental methods: ultrasound-guided biopsy



The thyroid nodule ultrasound-guided needle biopsy

http://www.jaypeejournals.com/eJournals/_eJournals%5C192%5C2011%5CSeptember-December%5Cimages/4_img_2.jpg
http://www.jaypeejournals.com/eJournals/_eJournals%5C192%5C2011%5CSeptember-December%5Cimages/4_img_3.jpg

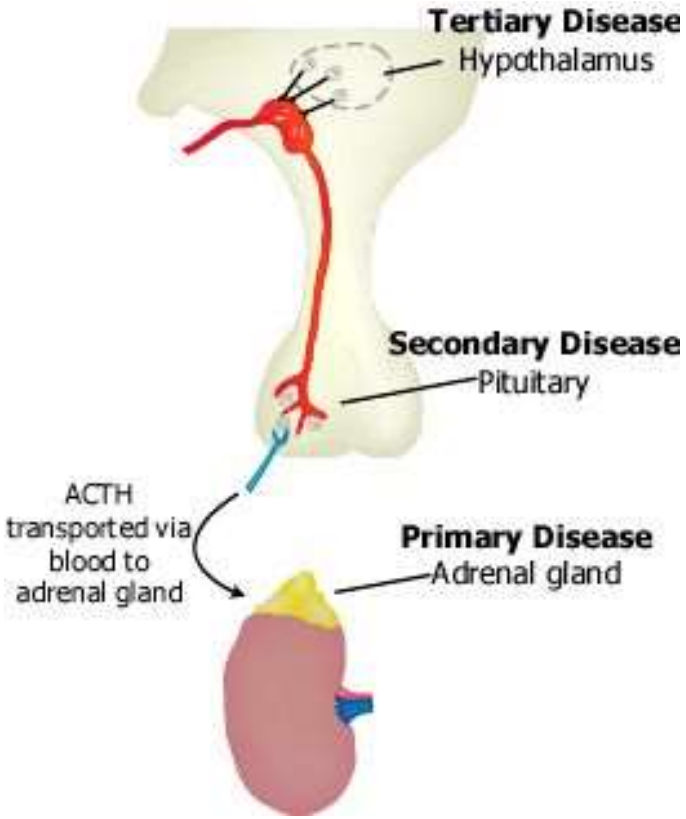
Instrumental methods: neuropen screening device

Neuropen is an effective screening aid , which combines two calibrated tests enabling the clinician to identify those patients most at risk of foot ulceration, when used in conjunction with symptomatic and clinical assessments

http://www.mortonmedical.co.uk/Neuropen_Screening_Device_for_Peripheral_Neuropathy_in_the_Diabetic_Foot~p~580.htm

Laboratory methods: Addison disease and adrenal insufficiency

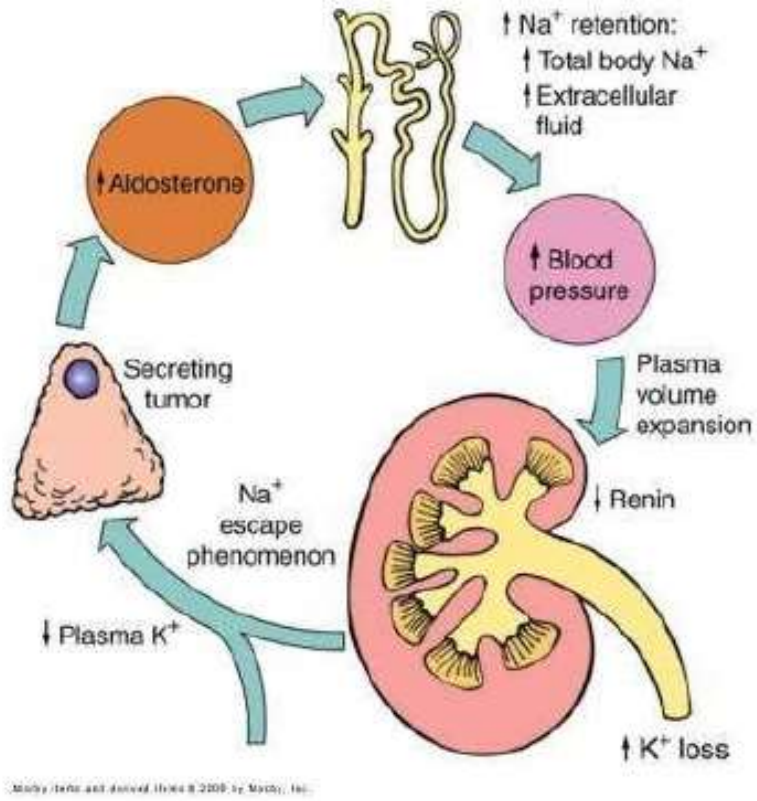
- Laboratory tests can determine if adrenal insufficiency is present, distinguish between primary and secondary insufficiencies, and help determine the underlying cause of the condition
- Tests will also be ordered to evaluate electrolyte balance, glucose level, and kidney function
- During an adrenal crisis, they are ordered to determine the severity of the imbalances and to monitor the effectiveness of treatment
- *Laboratory Tests:* Cortisol, ACTH, Creatinine (to monitor kidney function), Glucose (during an adrenal crisis)



https://labtestsonline.org/understanding/conditions/addisons-disease/start/2 http://www.endocrinesurgeon.co.uk/images/stories/content/adrenal-disease.jpg

Laboratory methods: Conn's syndrome (primary hyperaldosteronism)

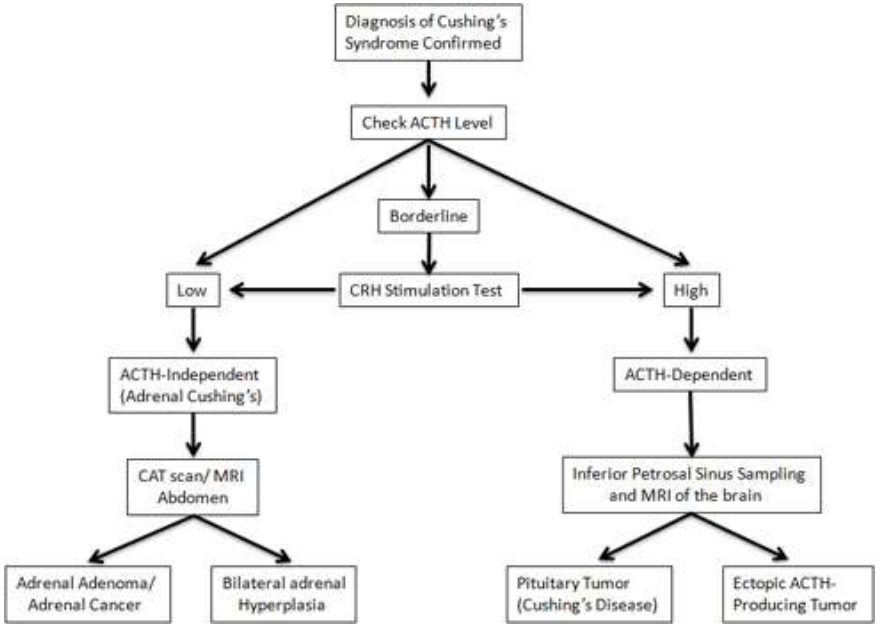
- The goals are to identify primary aldosteronism, distinguish between primary and secondary aldosteronism
- *Laboratory Tests:*
  Electrolytes (primarily decreased potassium and chloride along with increased carbon dioxide), Blood renin tests along with blood and/or 24-hour urine aldosterone tests, The ratio of aldosterone to renin (ARR) (to test for primary aldosteronism - if renin levels are low and aldosterone levels are high, then the ratio will be significantly increased and primary aldosteronism is the likely diagnosis)



https://labtestsonline.org/understanding/conditions/addisons-disease/start/2 http://www.endocrinesurgeon.co.uk/images/stories/content/adrenal-disease.jpg
http://image.slidesharecdn.com/chapter-21-endocrine-problems2161/95/chapter-21-endocrine-problems-35-728.jpg?cb=1287654973

Laboratory methods: Cushing syndrome or disease

- Testing for Cushing syndrome in 2stages:
  - Initial tests to verify that there is excess cortisol present (midnight plasma cortisol or late-night salivary cortisol, 24-hour urinary free cortisol test, the dexamethasone suppression screening test)
  - The second set of tests to determine the cause of the increased cortisol (pituitary, adrenal, or other)
- *Some general laboratory tests include:* CBC and differential (a high WBC count and increased number of neutrophils), Glucose tolerance test, Potassium



http://image.slidesharecdn.com/chapter-21-endocrine-problems2161/95/chapter-21-endocrine-problems-35-728.jpg?cb=1287654973

http://33.media.tumblr.com/tumblr_m48vmqTnSD1r99ahro1_500.gif

Laboratory methods: diabetes mellitus

- The goals of diabetes testing are to screen for high blood glucose levels (hyperglycemia), to detect and diagnose diabetes and prediabetes, to monitor and control glucose levels over time, and to detect and monitor complications
- Tests include:
- Fasting glucose (fasting blood glucose, FBG) – this test measures the level of glucose in the blood after an 8-12 hour fast
- A1c (also called hemoglobin A1c or glycohemoglobin) – this test evaluates the average amount of glucose in the blood over the last 2 to 3 months
- 2-hour glucose tolerance test (OGTT) – this test involves drawing a fasting blood test, followed by having a person drink a 75-gram glucose drink and then drawing another sample two hours after consuming the glucose

https://labtestsonline.org/understanding/conditions/diabetes/start/3

Instrumental methods: diabetes mellitus (glucose meter)

A medical device for determining the approximate concentration of glucose in the blood in 5 seconds

Fasting Glucose Level	Indication
From 70 to 99 mg/dL (3.9 to 5.5 mmol/L)	Normal fasting glucose
From 100 to 125 mg/dL (5.6 to 6.9 mmol/L)	Prediabetes (impaired fasting glucose)
126 mg/dL (7.0 mmol/L) and above on more than one testing occasion	Diabetes

https://upload.wikimedia.org/wikipedia/commons/6/62/Blausen_0301_Diabetes_GlucoseMonitoring.png
https://labtestsonline.org/understanding/conditions/diabetes/start/3

Laboratory methods : diabetes mellitus (HbA1c analyzing)

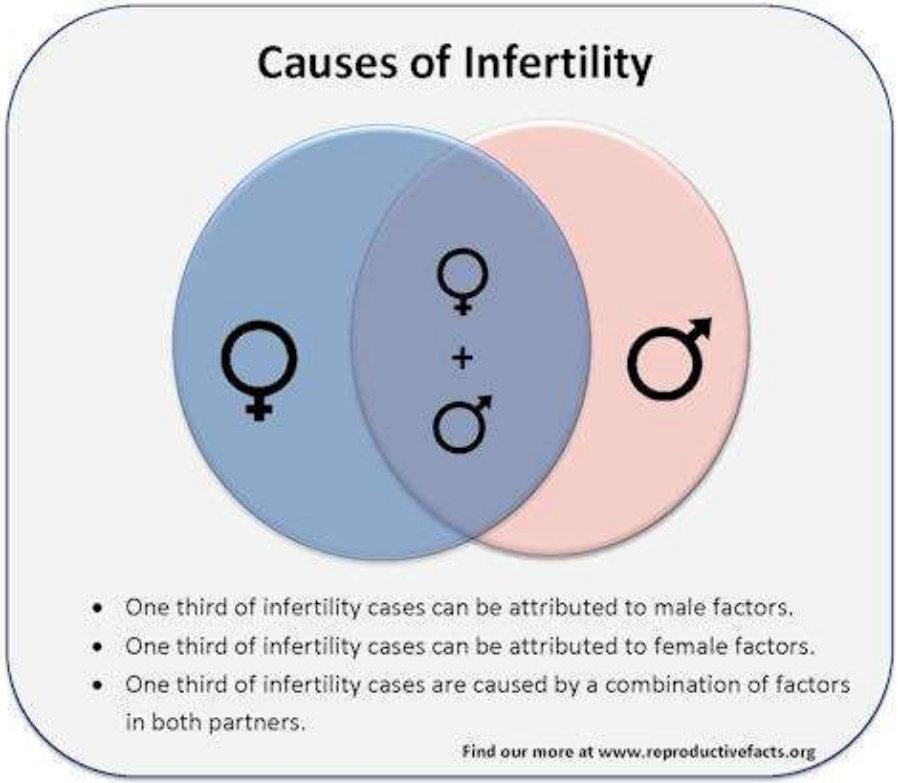
- The term HbA1c refers to glycated hemoglobin, that develops when hemoglobin, a protein within red blood cells that carries oxygen throughout your body, joins with glucose in the blood, becoming 'glycated'
- By measuring glycated hemoglobin (HbA1c), clinicians are able to get an overall picture of what patient's average blood sugar levels have been over a period of weeks/months
- HbA1c analyzers are available in several formats

A1c Level	Indication
Less than 5.7% (39 mmol/mol)	Normal
5.7% to 6.4% (39-46 mmol/mol)	Prediabetes
6.5% (47 mmol/mol) or higher	Diabetes

http://www.labcompare.com/10-Featured-Articles/136593-The-Streck-HbA1c-Cellular-Control-Intact-Red-Blood-Cells-for-Hemoglobin-A1c-Testing/
https://labtestsonline.org/understanding/conditions/diabetes/start/3 http://www.diabetes.co.uk/what-is-hba1c.html

Laboratory methods: infertility

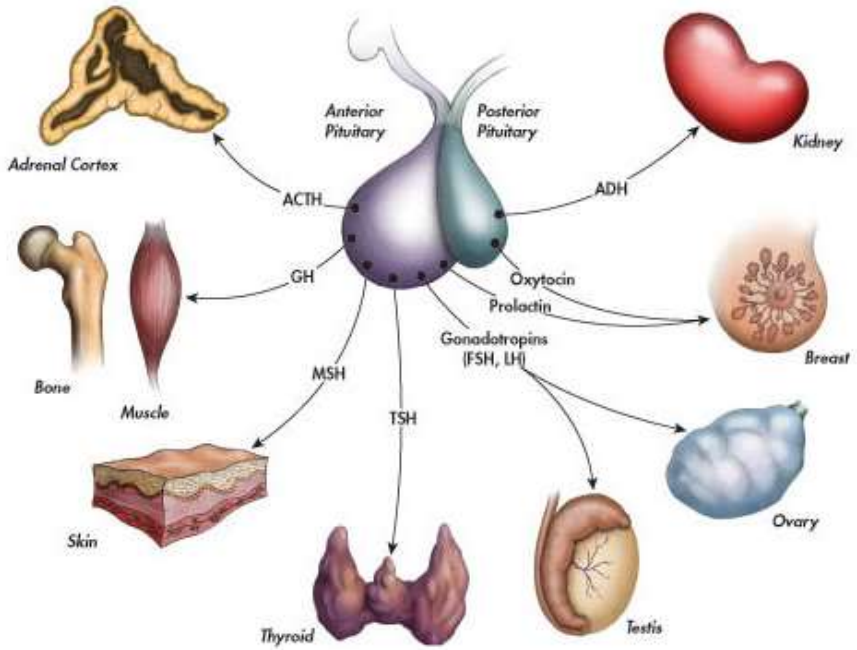
- **Tests of Female Fertility:** Luteinizing Hormone (LH), Follicle-stimulating hormone (FSH), Prolactin (PRL), Estradiol, Progesterone, Estrogen, Anti-Mullerian Hormone (AMH)
- **Tests of Male Fertility:** Free and total testosterone, Luteinizing hormone (LH), Follicle-stimulating hormone (FSH), Prolactin (PRL), Sex hormone binding globulin (SHBG), Presence of sperm antibodies



https://www.asrm.org/uploadedFiles https://labtestsonline.org/understanding/conditions/infertility/start/3

Laboratory methods: pituitary disorders

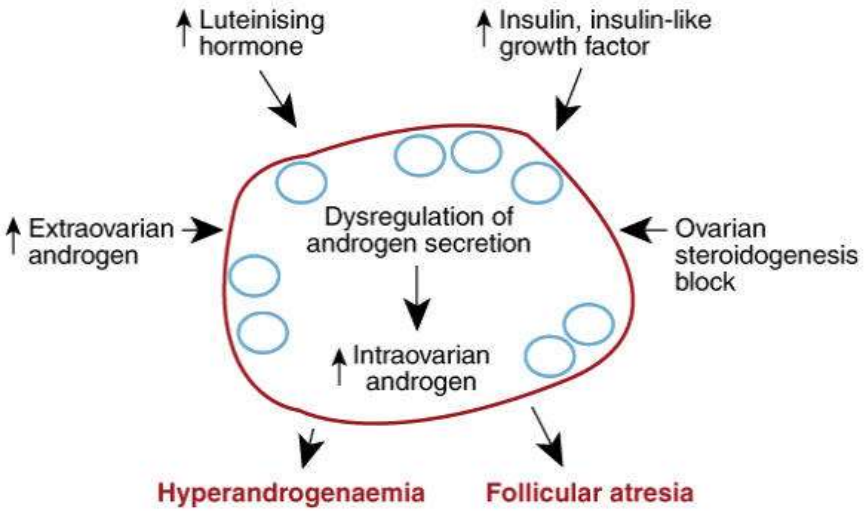
- The goals of pituitary disorder testing are to detect excess or deficient hormone production, determine its cause, and evaluate the severity of the condition
- Examples of *laboratory tests*: Prolactin, Luteinizing Hormone (LH), Follicle-stimulating hormone (FSH), Thyroid-stimulating hormone (TSH), Thyroxine, Basic metabolic panel (BMP - the current status of kidneys, electrolyte and acid/base balance, level of blood glucose), ACTH, Cortisol, growth hormone (GH) and Insulin-like Growth Factor - 1 (IGF-1), water deprivation test (to diagnose diabetes insipidus)



http://www.sdendocrinology.com/wp-content/uploads/2012/12/Pituitary.jpg https://labtestsonline.org/understanding/conditions/pituitary/start/2

Laboratory methods: polycystic ovary syndrome

- There is no specific test that can be used to diagnose polycystic ovary syndrome (PCOS) and there is no widespread agreement on what the diagnostic criteria should be
- *Laboratory Tests:* Follicle stimulating hormone (FSH) – normal or low; Lutenizing hormone (LH) – elevated; Testosterone –elevated; Estrogens – normal or elevated; Sex hormone binding globulin (SBGH) –reduced, Androstenedione – elevated; Human chorionic gonadotropin (hCG) – check for pregnancy; Anti-Müllerian hormone (AMH) –increased



http://www.sedico.net/English/SedicoInformationCenter/Physicians/AcetylcisteinPOCS/symptoms-symptoms.jpg https://labtestsonline.org/understanding/conditions/pcos/

Laboratory methods: thyroid diseases

- The first test a health practitioner will usually order to detect thyroid dysfunction is a test for thyroid stimulating hormone (TSH): if the TSH level is abnormal, the health practitioner will usually order a test for free thyroxine (free T4) to confirm the diagnosis
- TSH – to test for hypothyroidism, hyperthyroidism, screen newborns for hypothyroidism, and monitor treatment for thyroid disorders
- Free T4 – to test for hypothyroidism, hyperthyroidism, screen newborns for hypothyroidism, and to monitor treatment of thyroid disease
- Free T3 – primarily to test for hyperthyroidism, especially when the free T4 is not elevated; when people are iodine-deficient, the thyroid makes much more T3 than T4

http://www.ophthalmol.com/images/thyroid.jpghttps://labtestsonline.org/understanding/conditions/pcos/

Glossary of Patients Examination with Diseases of the Endocrine System

Endocrine System Glossary of Terms